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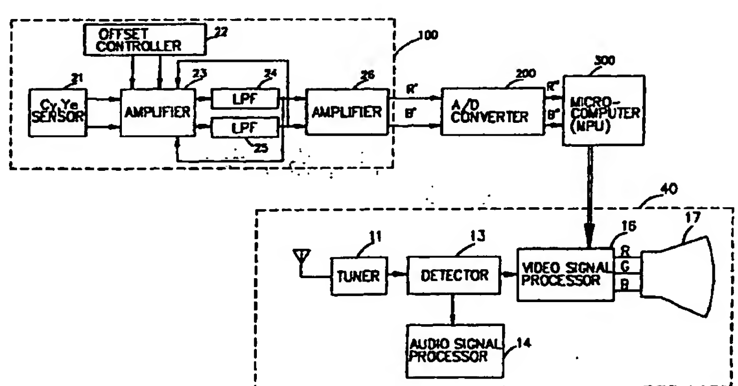
(54) Surrounding light judging method and video compensation control apparatus using the same

(57) A surrounding light judging method and a video compensation control apparatus which are capable of securing an optimum quality of picture by detecting a color signal near a video displaying instrument, judging a lighting environment from the detected color signal, and automatically correcting a video data in accordance with the judged lighting environment and a variation in the lighting environment. The method includes the steps of detecting a first color component and a second color component from a surrounding light, and judging a kinds of the light using the first and second color components.

FIG. 4A



EP 0 863 677 A1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a surrounding light judging method and a video compensation control apparatus using the same, and in particular to an improved surrounding light judging method and a video compensation control apparatus using the same which are capable of enabling an optimum watching quality by automatically correcting a video data in accordance with a surrounding lighting environment of a video displaying instrument.

2. Description of the Conventional Art

Generally, a color adaptation phenomenon is defined as a phenomenon that an original color is recognized as another color as human eyes are made adaptive by a predetermined light such as an incandescent light, a fluorescent light, etc.

Therefore, a television watcher may recognize the colors reproduced by a color picture tube as other colors by the above-described color adaptation phenomenon, so that it is impossible to enjoy the optimum quality of colors. Therefore, a video data is corrected based on the surrounding light environment for thus enabling an optimum quality of colors by providing a video correction (compensation) apparatus.

As shown in Figure 1, the conventional video compensation apparatus includes an RGB sensor 10 for detecting a RGB data based on the surrounding environment, a key selector 20, a microcomputer 30 for summing a RGB data detected by the RGB sensor 10 and outputting a video compensation data corresponding to the summed value, and a combined video signal processor 40 for processing a combined video signal received through the antenna and recovering a video signal and an audio signal.

The combined video signal processor 40 includes a tuner 11 for selecting a predetermined channel, an IF processor 12 for converting the combined video signal of the selected channel into an intermediate frequency signal, a detector 13 for detecting an intermediate frequency signal from the IF processor 12 and separating the thusly detected signal into a video intermediate frequency signal and an audio intermediate frequency signal, an audio processor 14 for recovering the audio intermediate frequency signal from the detector 13 and outputting the thusly recovered signal to a speaker 15, and a video processor 16 for recovering the video intermediate frequency signal from the detector 13 to an RGB signal in accordance with a video compensation data from the microcomputer 30.

The operation of the conventional video compensation apparatus will now be explained with reference to the accompanying drawings.

First, after the television is turned on by the key selection key 20, when a predetermined selection key is inputted, the microcomputer 30 outputs a channel selection data with respect to the output from the key selection key 20.

In addition, the microcomputer 30 receives an RGB data with respect to the surrounding environment detected by the RGB sensor 10, sums the RGB data ($S=D_R+D_G+D_B$), compares the previously set control data table shown in Figure 2A with the summed value S of the RGB data, judges the surrounding light and sets a control data and a W/B (White/Balance) which are correspond to the thusly judged light.

Namely, as shown in Figures 2A and 3A, when the summed value (S) is $0 \leq S < 2$, the microcomputer 30 judges the surrounding environment as a dark room, sets the control data as Contrast=30, Brightness=40, Saturation=40, and sharpness=30, and performs a first compensation step in Steps S3 and S4, and when the summed value S is $2 \leq S < 45$ in Step S5, the control data based on the summed value S is set, and the second through sixth compensation steps are performed in Steps S5 and S6.

In addition, when the summed value S is $45 \leq S$, the microcomputer 30 judges the surrounding light as a daylight, sets the control data as Contrast=100, Brightness=60, Saturation=55 and sharpness=60, and performs a seventh compensation step in Step S15.

In the first through seventh compensation steps, the microcomputer, as shown in Figures 2A and 3A, judges that the surrounding light corresponds to a dark room when the summed value S is $S < 2$, sets the W/B to 9000°K in Steps S20 through S23, and when the summed value S is $S \geq 45$, the surrounding light is judged as a daylight, and then the W/B is set as 13 000°K in Steps S24 and S25. When the summed value S is $2 \leq S < 45$, the W/B is set in accordance with the subtracted value between R and B in Step S26.

Namely, when the subtracted value S1 is $S1 \leq 0$, the surrounding light is judged to be a fluorescent lamp, and then the W/B is set as 12000°K in Steps S27 and S28. When the subtracted value is $S1 \leq 5$, the surrounding light is judged to be a fluorescent light and an incandescent lamp, and the W/B is set to 11000°K in Steps S29 and S30. When the subtracted value is $S1 \geq 5$, the surrounding light is judged to be an incandescent lamp, and the W/B is set to 10 000°K in Step S31.

Therefore, the tuner 11 selects a predetermined channel in accordance with the channel selection data from the microcomputer 30, and the IF processor 12 converts the combined video signal of the selected channel into an intermediate frequency signal, and the detector 13 separates the thusly converted intermediate frequency signal into a video intermediate frequency signal and an audio frequency signal.

Consequently, the separated audio intermediate frequency signal is recovered to an audio signal by the audio processor 14 and outputted to the speaker 15. The video processor 16 receives a video intermediate frequency signal from the detector 13, compensates the video compensation the video signals in accordance with the video compensation data set by the microcomputer 30 and the W/B, and displays the thusly compensated video signals on the color picture tube 17.

However, in the conventional video compensation apparatus, when the brightness of the surrounding light is decreased, the summed value S is decreased. The brightness of the surrounding light may be erroneously detected due to the low summed value for thus causing a malfunction of the system.

In addition, when the brightness of the surrounding light is high, for example, when the summed value S is S≥46, since the microcomputer 30 the identical W/B, it is impossible to set the W/B based on the brightness judged.

Furthermore, in the conventional video compensation apparatus, since the color adaptation phenomenon is not considered, it is impossible to secure a quality picture.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a surrounding light judging method and a video compensation control apparatus using the same which overcome the aforementioned problem encountered in the conventional art.

It is another object of the present invention to provide an improved surrounding light judging method and a video compensation control apparatus which are capable of securing an optimum quality of picture by detecting a color signal near a video displaying instrument, judging a lighting environment from the detected color signal, and automatically correcting a video data in accordance with the judged lighting environment and a variation in the lighting environment.

To achieve the above objects, there is provided a surrounding light judging method which includes the steps of detecting a first color component and a second color component from a surrounding light, and judging a kinds of the light using the first and second color components.

Additional advantages, objects and features of the invention will become more apparent from the description which follows.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

Figure 1 is a bock diagram illustrating a conventional video compensation apparatus;
Figure 2A is a setting table of a control data based on a summed value S in the conventional apparatus;
Figure 2B is a setting table of W/B based on a summed value S in the conventional apparatus;
Figure 3A is a flow chart illustrating a compensation step based on a summed value S in the conventional apparatus;
Figure 3B is a flow chart illustrating a W/B setting step based on a summed value S and subtracted value S1 in the conventional apparatus;
Figure 4A is a block diagram illustrating a video compensation control apparatus according to the present invention;
Figure 4B is a detailed circuit diagram illustrating a color detector in the apparatus of Figure 4A;
Figure 5A is a table illustrating a video compensation data corresponding to a surrounding light judged by a color component ratio;
Figure 5B is a table illustrating a setting value of a video data based on a summed value S according to the present invention;
Figure 6 is a flow chart illustrating a compensation video data setting step and a video compensation step based on a color component ratio according to the present invention;
Figure 7 is a flow chart illustrating a light and light change judging step based on a color component ratio and a video compensation step based on a color characteristic according to the present invention;
Figure 8 is a graph illustrating an output voltage ratio between Ye and Cy with respect to an incandescent lamp and a fluorescent lamp according to the present invention;
Figure 9 is a graph illustrating an output voltage ratio between Ye and Cy based on a color temperature according

to the present invention; and

Figure 10 is a view illustrating a judging level of a surrounding light source which is determined by an output voltage ratio of two photo sensors according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Figure 4A illustrates a video compensation control apparatus according to the present invention which includes a color detector 100 for detecting a Cy and Ye color component from the component of a surrounding light and outputting as R' and B' values, an A/D converter 200 for digital-converting the R' and B' values from the color detector 100 and outputting R" and B" values, a microcomputer (MPU) 300 for judging a surrounding light in accordance with the R" and B" values converted by the A/D converter 200 and outputting a video compensation data in accordance with the thusly judged light, and a combined video signal processor 40 for processing the combined video signals received through an antenna and recovering the thusly received signals into a video signal and an audio signal.

As shown in Figure 4A, the color detector 100 includes a Cy and Ye sensor 21, an offset controller 22, an amplifier 23, low pass filters 24 and 25, and an amplifier 26.

In addition, the combined video signal processor 40 is configured identically to the conventional art. Therefore, in the drawings, only the tuner 11, the detector 13, the audio signal processor 14, the video signal processor and the CPT 17 are shown therein.

The operation of the video compensation control apparatus according to the present invention will now be explained with reference to the accompanying drawings.

When the Cy and Ye sensors 21-1 and 21-2 of the color detector 100 detect a Cy and Ye color component from light near the color display instrument, the amplifiers 23-1 and 23-2 amplify the Cy and Ye color components detected in accordance with the offset voltage set by the input offset voltage controllers 22-1 and 22-2 and the output offset voltage controllers 22-3 and 22-4. The thusly amplified Cy and Ye color components are filtered by the low pass filters 24 and 25 and outputted as color signals R' and B' through the amplifiers 26-1 and 26-2. At this time, the resistors R12 and R32 control the ratio between the Cy and Ye color components and the color signals R' and B'.

In addition, the color signals R' and B' from the color detector 100 are converted into digital color signals R" and B" by the A/D converter 200, and the microcomputer 300 creates various video compensation data from the digital-converted values R" and B".

The video compensation data setting procedures based on the surrounding light judging and judged surrounding light using the color signal component ratio will now be explained.

As shown in Figure 6, the microcomputer 300 computes a value G" from the digital color signals R" and B" from the A/D converter 200, namely, G"=(R"+B")/3 , the thusly computed value G" and values R" and B" are summed, namely, SUM=R"+G"+B" . In addition, the color signal component ratio (Ratio=B"/R") of the values B" and R" are computed in Steps S100 through S103.

Therefore, the microcomputer 300 sets the video compensation data, as shown in Figure 5B, such as Contrast, Brightness, Saturation, Sharpness, in Step S104 and judges the kind of the light in accordance with the color signal component ratio (Ratio=B"/R"). The color temperature (W/B), TINT, X-axis, Sub-color, etc. which are previously stored in the table as shown in Figure 5A are set in accordance with the judged light for thus performing a compensation operation.

Namely, when the color signal component ratio is Ratio>2, the light is judged as a daylight. Therefore, a first compensation data having a color temperature (W/B) of 11000°K, TINT(G)=1, and X-axis=Japan is outputted in Steps S105 and S106. In addition, when the color signal component ratio is 1<Ratio<2, the light is judged as a C-light source (fluorescent lamp), a second compensation data having a color temperature (W/B) of 9500°K, TINT(G)=3, and X-axis=Japan is outputted in Steps S107 and S108.

In addition, the third and fourth compensation data are outputted , respectively, when the color signal component ratio is 0.8<Ratio<1, and the color signal component ratio is Ratio<0.8, for thus controlling a video in Steps S109 through S112.

When the light corresponds to the night light (dark state), since the color signal component ratio is Ratio=0/0, it is impossible to compute. At this time, the video signal is controlled using a light such as the light source "A".

Consequently, the video signal processor 16 of the combined video processor 40 re-processes the video signals in accordance with a video compensation data from the microcomputer 300 and displays on the screen of the color picture tube 17.

After the video is compensated, the microcomputer 300 continuously receives color signals R" and B" detected by the color detector 100, computes a value G", a SUM value, and a ratio, and judges and memories the light using the computed color signal component ratio in Steps S100, S103 and S114.

The computed color signal component ratio and the previously memorized color signal component ratio are compared for thus judging whether a light is varied in Step S115. At this time, if the light is not varied, the video compensa-

tion data is outputted in accordance with the summed value SUM in Step S116. When the light is varied, the current video compensation data is maintained for a predetermined time based on the color adaptation phenomenon of eyes, and a video compensation is performed based on the color adaptation.

Namely, when the color signal component ratio is Ratio>2, the first compensation data is gradually varied based on the color adaption phenomenon and then is outputted in Steps S120 and S121. When the color signal component ration is 1<Ratio<2, the second compensation data is gradually varied and outputted in Steps S121 and S122.

In addition, when the color signal component ratio is 0.8<Ratio<1, and the color signal component ratio is Ratio<8, the third and fourth compensation data are gradually varied and outputted in Steps S123 through S126. When the lighting condition is changed, the compensation data is varied step-by-step based on the color adaption of humans.

Therefore, the video signal processor of the combined video processor 40 processes the video compensation data which is varied step-by-step bt the microcomputer 300 and displays on the screen of the color picture tube 17, so that a television watcher enjoys a quality picture irrespective of the variation of surrounding light.

In addition, in the present invention, there is a method for judging he surrounding light based on the ratio of the output voltages of the Cy and Ye sensors 21-1 and 21-2.

First, the two magnetic pole values of the output voltages Ye and Cy from the Cy and Ye sensors 21-1 and 21-2 are changed to the three magnetic pole values of X, Y, and Z based on the international lighting committee (CIE) as follows.

Equation 1

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix} \cdot \begin{bmatrix} Y_e \\ C_y \end{bmatrix} = M \cdot \begin{bmatrix} Y_e \\ C_y \end{bmatrix}$$

$$M = \begin{bmatrix} 0.7619 & -0.0623 \\ 0.8111 & 0.0845 \\ -0.6667 & 1.3505 \end{bmatrix}$$

Therefore, it is possible to obtain an X-Y coordinate of a light based on the values of X, Y and Z based on Equation 1.

$$x=\frac{X}{X+Y+Z},\ y=\frac{Y}{X+Y+Z},\ z=\frac{Z}{X+Y+z} \qquad \text{Equation 2}$$

Thereafter, Equation 2 is adapted to Equation 1 and then the resultant value is divided by the magnetic pole value "Y" for thus obtaining the following expression.

$$\begin{bmatrix} \frac{X}{Y} \\ \frac{Y}{Y} \\ \frac{Z}{Y} \end{bmatrix} = \begin{bmatrix} \frac{x}{y} \\ 1 \\ \frac{z}{y} \end{bmatrix} = \frac{1}{Y} \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix} \cdot \begin{bmatrix} Y_e \\ C_y \end{bmatrix} \qquad \text{Equation 3}$$

The first row and third row of Equation 3 are reversely changed, thus obtaining the following equation.

$$\begin{bmatrix} Ye \\ Cy \end{bmatrix} = Y \cdot \begin{bmatrix} a_{11} & a_{12} \\ a_{31} & a_{32} \end{bmatrix}^{-1} \cdot \begin{bmatrix} \frac{x}{y} \\ \frac{z}{y} \end{bmatrix} \qquad \text{Equation 4}$$

Therefore, an expression of $Y=a_{21}Ye+a_{22}C$ is obtained. In addition, assuming the following condition is made based on Equation 3:

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{31} & a_{32} \end{bmatrix}^{-1} = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix}$$

The following Equation 5 is obtained.

$$\begin{bmatrix} Y_e \\ C_y \end{bmatrix} = (a_{21}\ Y_e \div a_{22}\ C_y) \cdot \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \cdot \begin{bmatrix} \frac{x}{y} \\ \frac{z}{y} \end{bmatrix} \qquad \text{Equation 5}$$

In addition, the relationship between the output voltages Ye and Cy of the Cy and Ye sensors 21-1 and 21-2 based on Equation 5 may be expressed as follows.

$$Ye = \frac{b_{11x} + b_{12z}}{b_{21x} + b_{22z}} \cdot Cy \qquad \text{Equation 6}$$

Therefore, the ratios between the output voltages Ye/Cy with respect to the fluorescent lamp (x=0.313, y=0.332, W/B=6500°K) and the incandescent lamp (x=0.417, y=0.396, W/B=3300°K) are shown in Figure 8. As a result, if the ratio of the voltage Ye with respect to the voltage Cy is about 1.4, this ratio corresponds to the incandescent lamp, and the ratio is about 0.9, the ratio corresponds to the fluorescent lamp.

In addition, an experiment was performed based on the output voltage ratio Ye/Cy at a color temperature range of 2000°K to -8000°K at every 100°K interval with respect to - 10,0,10,30 and 50MPCD in order to study the relationship between the output voltages Cy and Ye based on the color temperature W/B. As a result of the experiment, as the value of MPCD is increased, the output voltage ratio of Ye/Cy is increased. Even when the identical output voltage is provided, the color temperature is different.

However, the color temperature ranges of the incandescent lamp. with respect to the surrounding light source was 3000°K to 4000°K, and the MPCD was about -10, the color temperature range of the fluorescent lamp. was 6500°K to 7500°K, and the MPCD was 50 to 60. As shown in Figure 9, the output voltage ratio of Ye/Cy in the case of the incandescent lamp was 1/17 to 1.39, and the output voltage ratio of Ye/Cy in the case of the fluorescent lamp was 0.88 to 0.97.

In addition, when the fluorescent lamp and the incandescent lamp are mixed, as shown in Figure 10, the output voltage ratio is defined between the output voltage ratios of Ye/Cy of the incandescent lamp and the fluorescent lamp. Therefore, it is possible to recognize the kind of the surrounding light source using the output voltage ratio of the Cy and Ye sensors 21-1 and 21-2.

As described above, in the present invention, it is possible to secure the optimum picture quality by detecting the surrounding light environment near the video display instrument and automatically correcting the video data in accordance with any variation of the detected light and the lighting environment.

In addition, in the present invention, since only two outputs R" and B" are used, it is possible to reduce the number of ports of the input side from 3 to 2, and reduce the deviation due to the offset by adjusting the input and output offset voltage.

Furthermore, it is possible to enable better picture quality by using the color adaptation phenomenon of humans and it is possible to accurately maintain the W/B with respect to a predetermined brightness from the high brightness to the low brightness using the color signal component ratio.

Although the preferred embodiment of the present invention has been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as recited in the accompanying claims.

Claims

1. A surrounding light judging apparatus, comprising:

   a detector for detecting a first color component and a second color component from a surrounding light; and
   a judging unit for judging a kind of the light using the first and second color components.

2. The apparatus of claim 1, further comprising:

   a means for computing a third primary color component using the first and second color components.

3. A video compensation control apparatus based on a surrounding light judging method, comprising:

   a detector for detecting a first color component and a second color component from a surrounding light;
   a judging unit for judging a kind of the light using the first and second color components;
   a memory unit for memorizing a video compensation data in accordance with a kind of the light; and
   a video processor for receiving a video compensation data from the memory unit in accordance with a kind of the light judged by the judging unit and performing a video compensation operation.

4. A surrounding light judging method, comprising the steps of:

   detecting a first color component and a second color component from a surrounding light; and
   judging a kinds of the light using the first and second color components.

5. A video correction control method based on a surrounding light judging, comprising the steps of:

   detecting a first color component and a second color component from a surrounding light;
   computing a ratio between the first and second color components;
   judging a corresponding light based on the ratio computed; and
   compensating a video signal using a corresponding video compensation data in accordance with a kind of the light judged.

6. The method of claim 5, further comprising a step of:

detecting a light variation after the light judging step, whereby a current video data is maintained for a predetermined time when the light is varied, for thus compensating a video data.

7. The method of claim 6, wherein said video data which is compensated, is varied step-by-step.

8. A surrounding light judging apparatus, comprising:

a color detection means for detecting a color signal; and
a light judging means for judging a ratio of a color output signal from the color detection means and reading a light data from the memory means.

9. The apparatus of claim 8, wherein said color detection means is a Ye and Cy sensor.

10. A color temperature determining apparatus, comprising:

a color detection means for detecting a color signal;
a memory means for memorizing a light data corresponding to an output ratio of the color signal detected and a color temperature data of the light;
a light judging beans for judging an output ratio in accordance with the color output signal from the color detection means and reading a light data from the memory means; and
a light-based color temperature determination means for determining a color temperature of a light in accordance with a result of the light judgement.

11. A light classifying method, comprising the steps of:

obtaining a matrix for changing an output voltage from a color detection means into three magnetic pole values of X, Y and Z which has a linear form; and
obtaining an output voltage ratio of the color detection means using a converted matrix coefficient and an X-Y coordinate of a predetermined light and classifying the light in accordance with the obtained output voltage ratio.

12. A display white determination method, comprising the steps of:

judging a color temperature of a light; and
determining a display white of a video display instrument in accordance with the color temperature judged.

FIG. 1

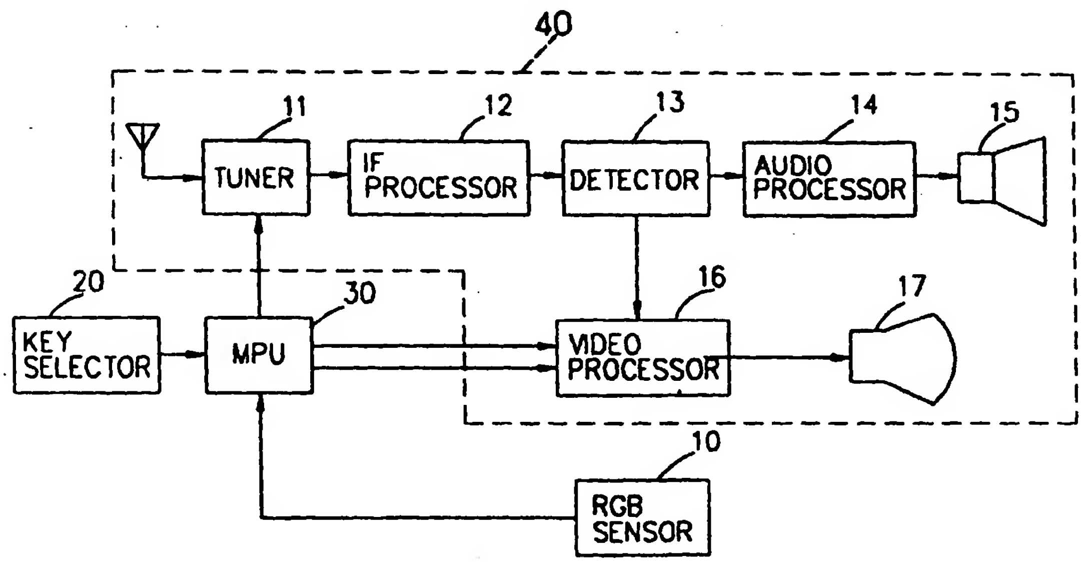

40
11
12
13
14
15
TUNER
IF PROCESSOR
DETECTOR
AUDIO PROCESSOR
20
30
16
17
KEY SELECTOR
MPU
VIDEO PROCESSOR
10
RGB SENSOR

FIG. 2A

SUM OF R,G & B(S) / ITEM	$0 \leq S < 2$ (0–10lux)	$2 \leq S < 10$ (10–30lux)	$10 \leq S < 20$ (30–50lux)	$20 \leq S < 31$ (50–70lux)	$31 \leq S < 37$ (70–85lux)	$37 \leq S < 45$ (85–100lux)	$45 \leq S$ (100lux–)
CONTRAST	30	40	55	70	85	93	100
BRIGHTNESS	40	42	46	50	54	57	60
SATURATION	40	41	45	48	51	53	55
SHARPNESS	30	33	39	45	51	55	60
LIGHTING	NO LIGHT (DARKROOM)	INDIRECT (1)	INDIRECT (2)	STANDARD	STRONG (1)	STRONG (2)	DAYLIGHT
COMPENSATION STEP	FIRST	SECOND	THIRD	FOURTH	FIFTH	SIXTH	SEVENTH

FIG. 2B

VALUE OF R,G & B		WHITE BALANCE (COLOR TEMPERATURE)	COLOR COORDINATE		LIGHTING
			X	Y	
$R+G+B \geq 45$		13000°K	266	280	DAYLIGHT
$R+G+B<2$		9000°K	270	284	DARKROOM
$2 \leq R+G+B<45$	$0 \leq B-R$	12000°K	274	289	FLUORESCENT LAMP
	$1 \leq R-B \leq 4$	11000°K	279	296	FLUORESCENT LAMP + INCANDESCENT LAMP
	$5 \leq R-B$	10000°K	285	303	INCANDESCENT LAMP

FIG. 3A

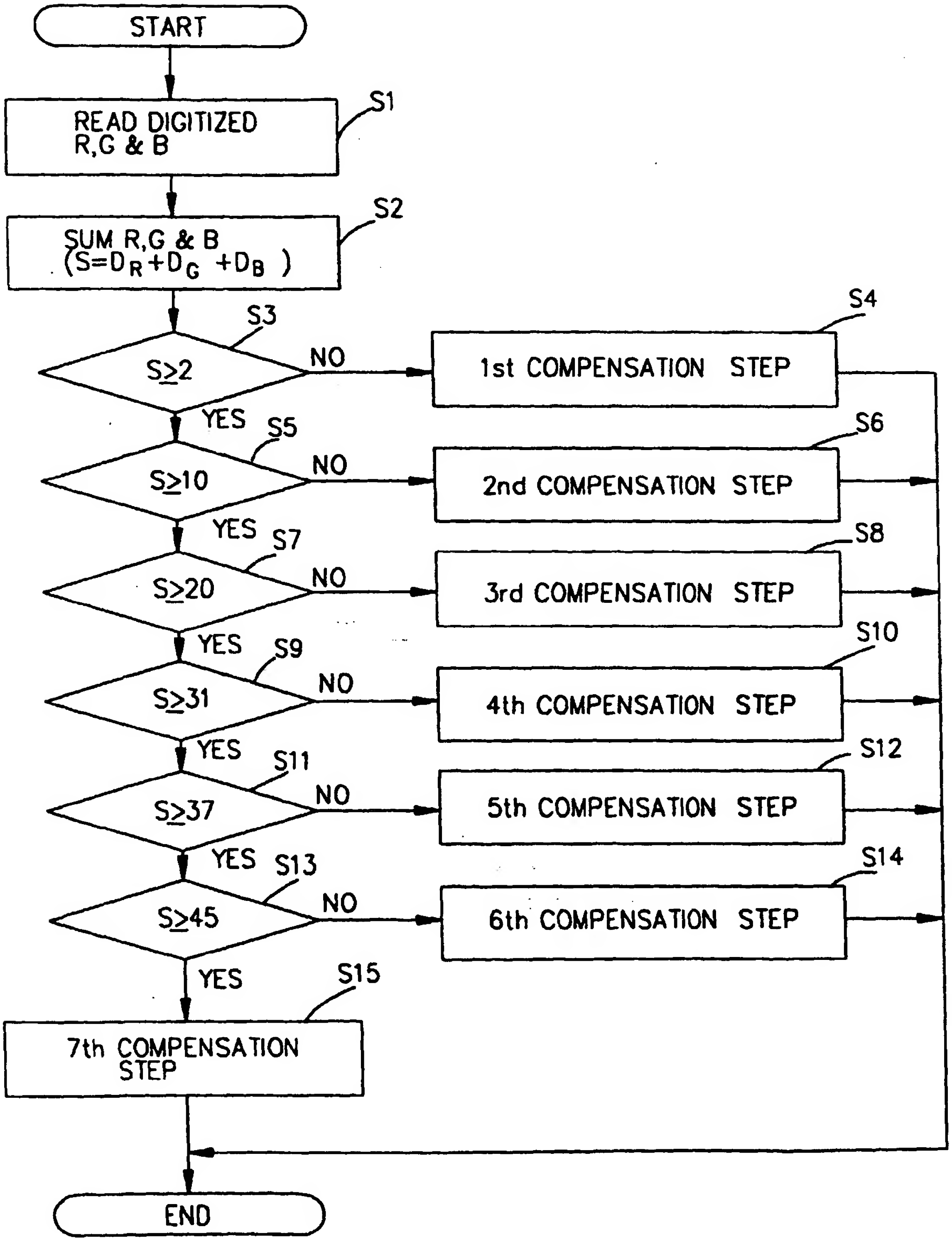

START
READ DIGITIZED R,G & B
S1
SUM R,G & B (S=D_R+D_G +D_B)
S2
S3
S≥2
NO
S4
1st COMPENSATION STEP
YES
S5
S≥10
NO
S6
2nd COMPENSATION STEP
YES
S7
S≥20
NO
S8
3rd COMPENSATION STEP
YES
S9
S≥31
NO
S10
4th COMPENSATION STEP
YES
S11
S≥37
NO
S12
5th COMPENSATION STEP
YES
S13
S≥45
NO
S14
6th COMPENSATION STEP
YES
S15
7th COMPENSATION STEP
END

FIG. 3B

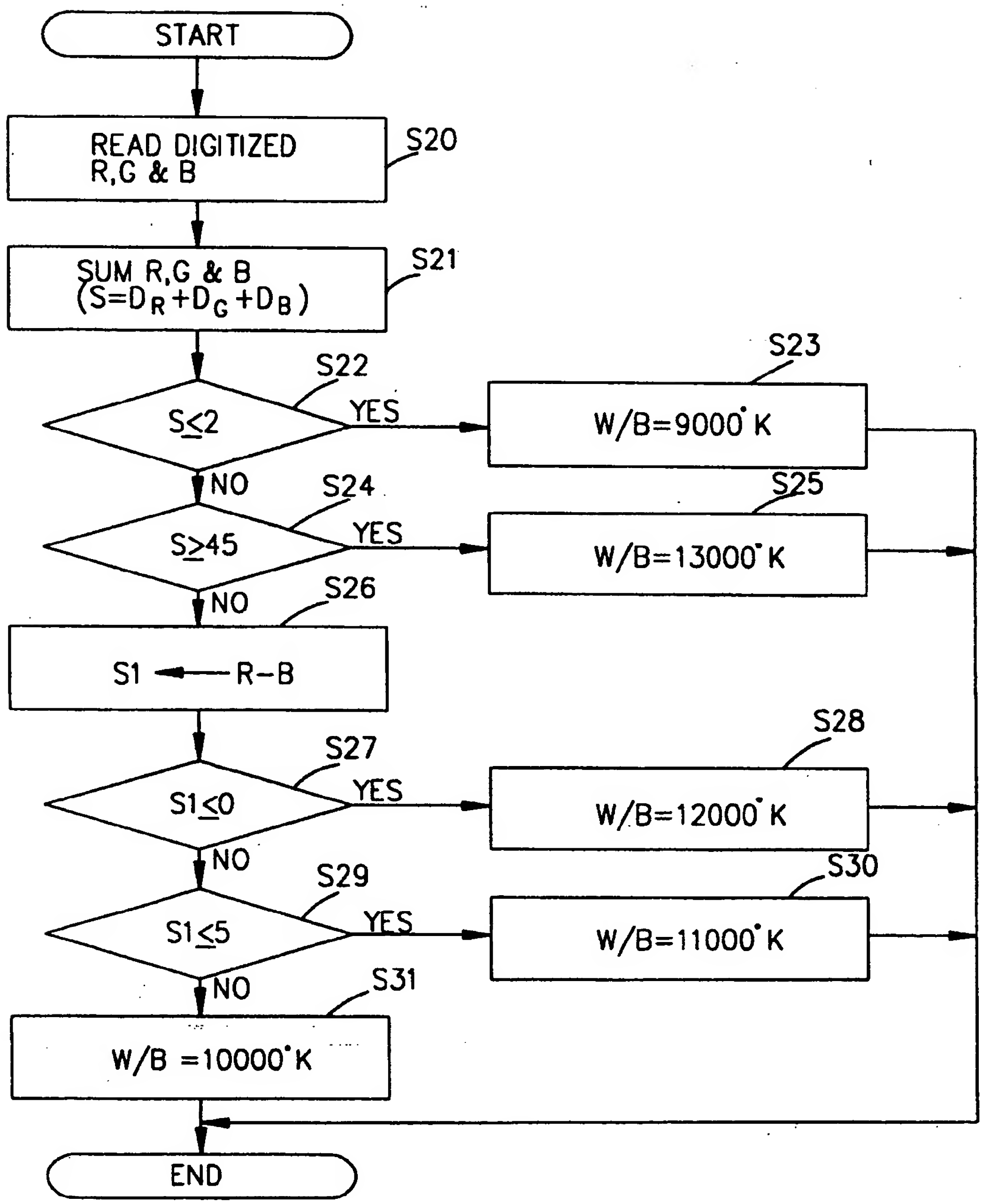

START
READ DIGITIZED R,G & B
S20
SUM R,G & B
$(S=D_R+D_G+D_B)$
S21
S22
$S\leq2$
YES
S23
W/B=9000°K
NO
S24
$S\geq45$
YES
S25
W/B=13000°K
NO
S26
S1 ← R−B
S27
$S1\leq0$
YES
S28
W/B=12000°K
NO
S29
$S1\leq5$
YES
S30
W/B=11000°K
NO
S31
W/B =10000°K
END

FIG. 4A

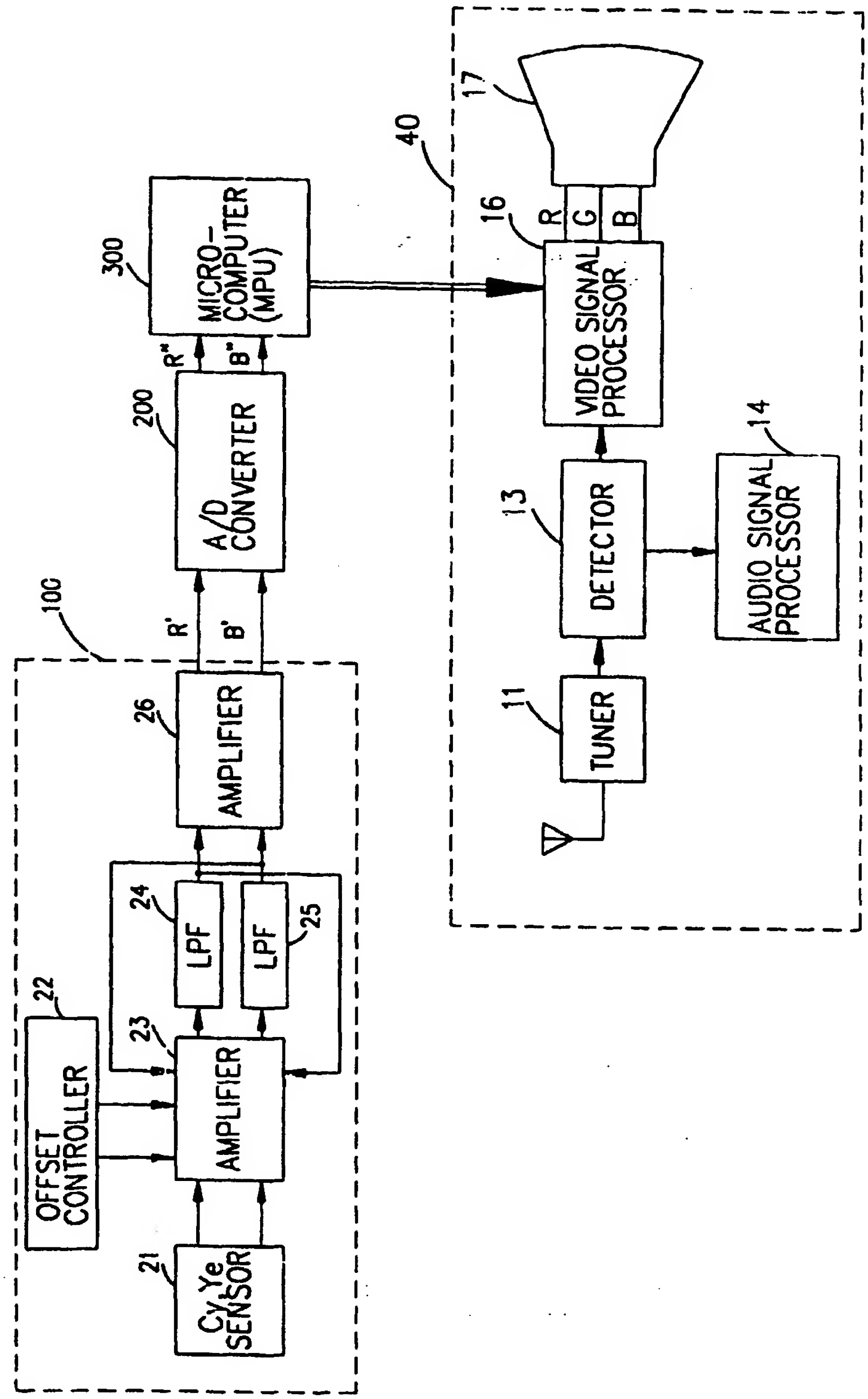

100
21
Cy Ye SENSOR
22
OFFSET CONTROLLER
23
AMPLIFIER
24
LPF
25
LPF
26
AMPLIFIER
R'
B'
200
A/D CONVERTER
R"
B"
300
MICRO-COMPUTER (MPU)
40
11
TUNER
13
DETECTOR
14
AUDIO SIGNAL PROCESSOR
16
VIDEO SIGNAL PROCESSOR
R
G
B
17

FIG.4B

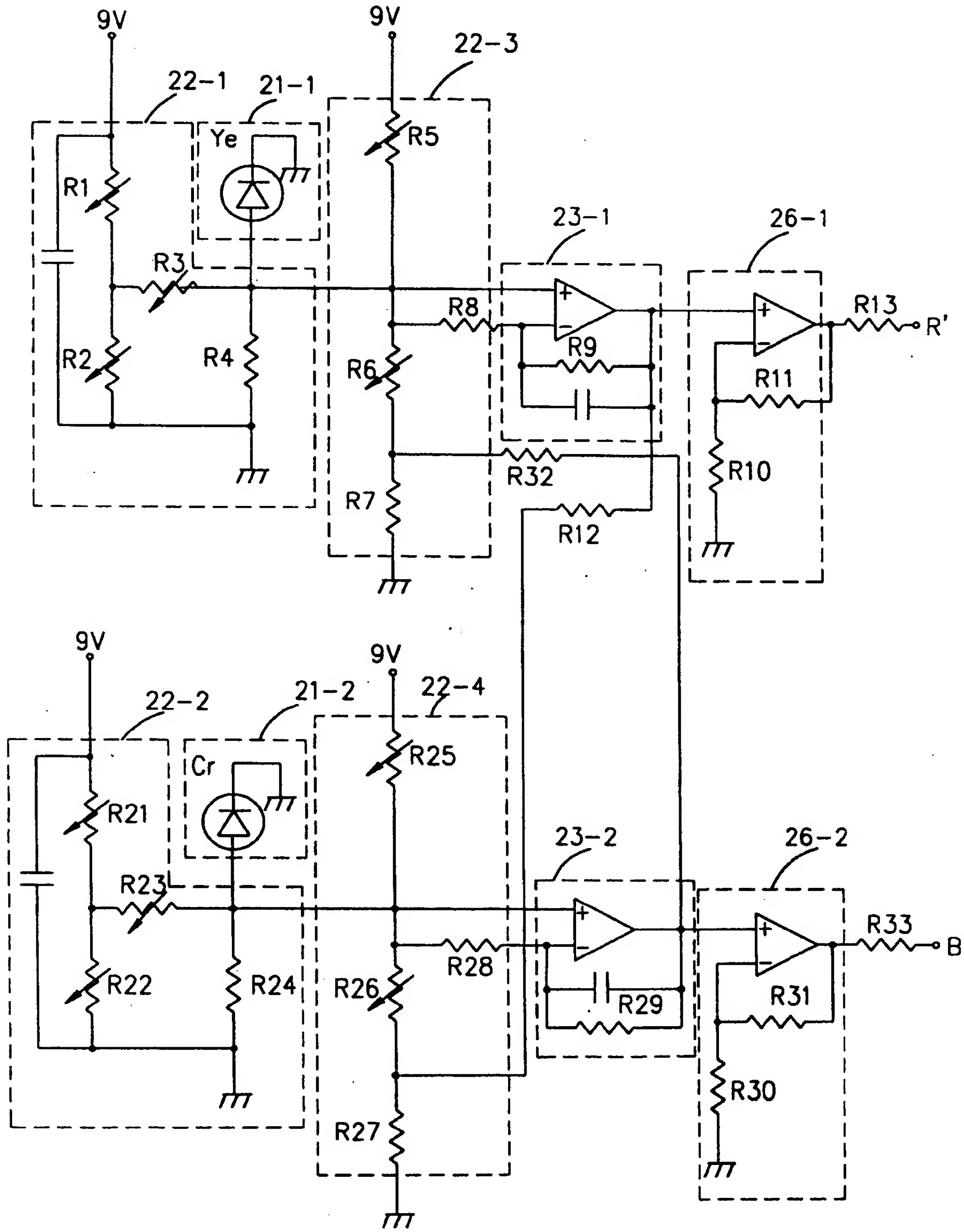

9V
22-1
21-1
Ye
R1
R3
R2
R4
9V
22-3
R5
R6
R7
R8
23-1
R9
R32
R12
26-1
R11
R10
R13
R'
9V
22-2
21-2
Cr
R21
R23
R22
R24
9V
22-4
R25
R26
R27
R28
23-2
R29
26-2
R31
R30
R33
B'

FIG.5A

NO	LIGHTING	COLOR TEMP(W/B)	TINT	X-AXIS	SUB-COLOR	REMARKS
1	DAYLIGHT(D65)	11000 °K	G → 1	JAPAN	LIGHT SOURCE "A" OR DARK STATE SUB-COLOR → 2	RATIO>2
2	LIGHT SOURCE "C" (FLUORESCENT LAMP)	9500 °K	G → 3	JAPAN		1<RATIO<2
3	LIGHT SOURCE "A+C"	8500 °K	G → 4	US		0.8<RATIO<1
4	LIGHT SOURCE "A" (INCANDESCENT LAMP)	7500 °K	G → 7	US		RATIO<0.8
5	FACTORY SETTING	12000 °K	0	JAPAN		—

FIG.5B

SUM	0~6	7~10	11~15	16~20	114~120	121 ~ 129	130 ~ 139	140 ~
CONTRAST	35	37	40	43	93	95	98	100
BRIGHTNESS	50	51	51	52	59	59	59	66
SATURATION	45	45	46	46	54	55	55	55
SHARPNESS	35	36	37	38	56	59	58	60

FIG.6

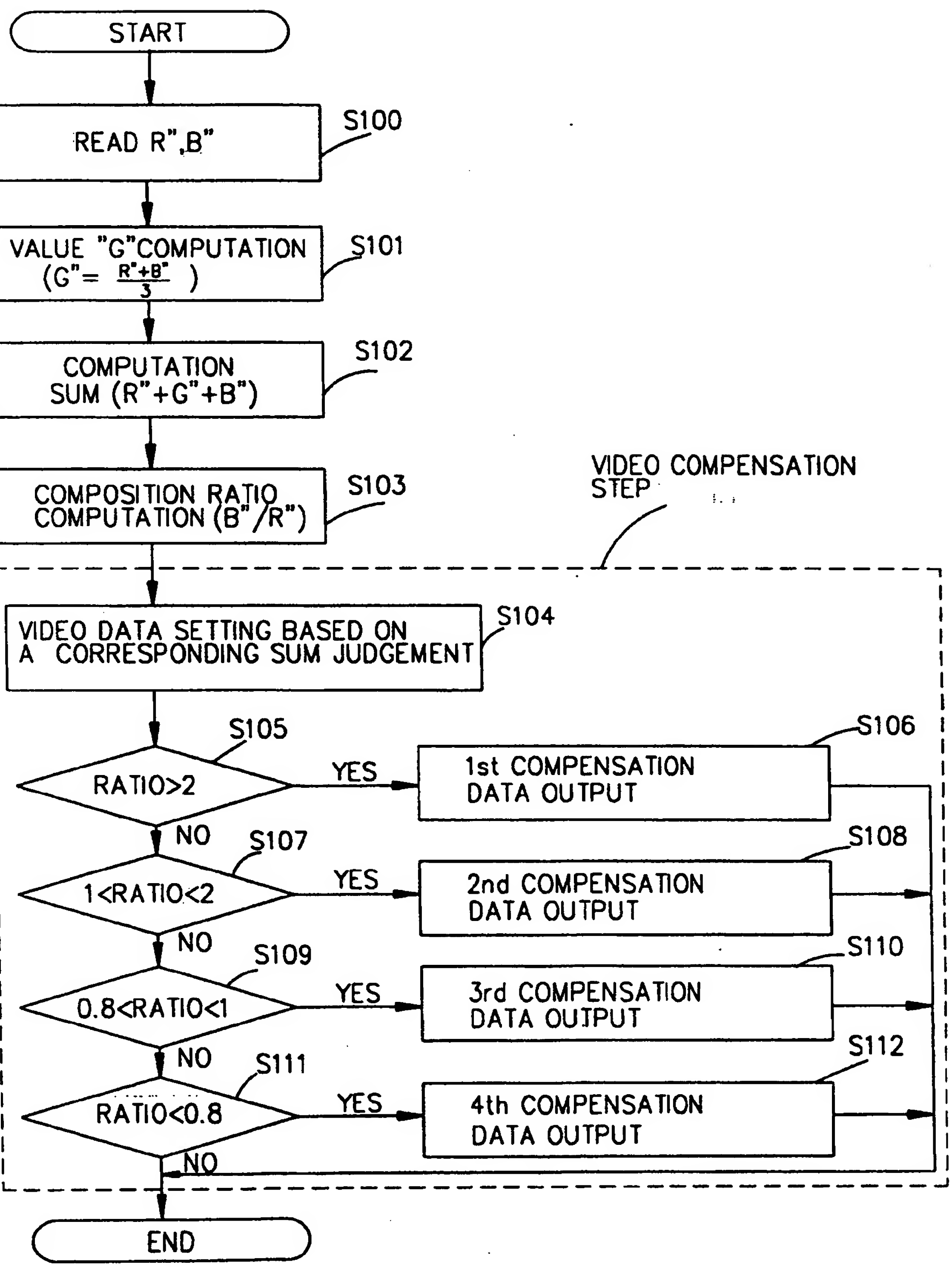

START
READ R",B"
S100
VALUE "G"COMPUTATION
(G"= R"+B" / 3)
S101
COMPUTATION
SUM (R"+G"+B")
S102
COMPOSITION RATIO
COMPUTATION (B"/R")
S103
VIDEO COMPENSATION
STEP
VIDEO DATA SETTING BASED ON
A CORRESPONDING SUM JUDGEMENT
S104
S105
RATIO>2
YES
1st COMPENSATION
DATA OUTPUT
S106
NO
S107
1<RATIO<2
YES
2nd COMPENSATION
DATA OUTPUT
S108
NO
S109
0.8<RATIO<1
YES
3rd COMPENSATION
DATA OUTPUT
S110
NO
S111
RATIO<0.8
YES
4th COMPENSATION
DATA OUTPUT
S112
NO
END

FIG. 7

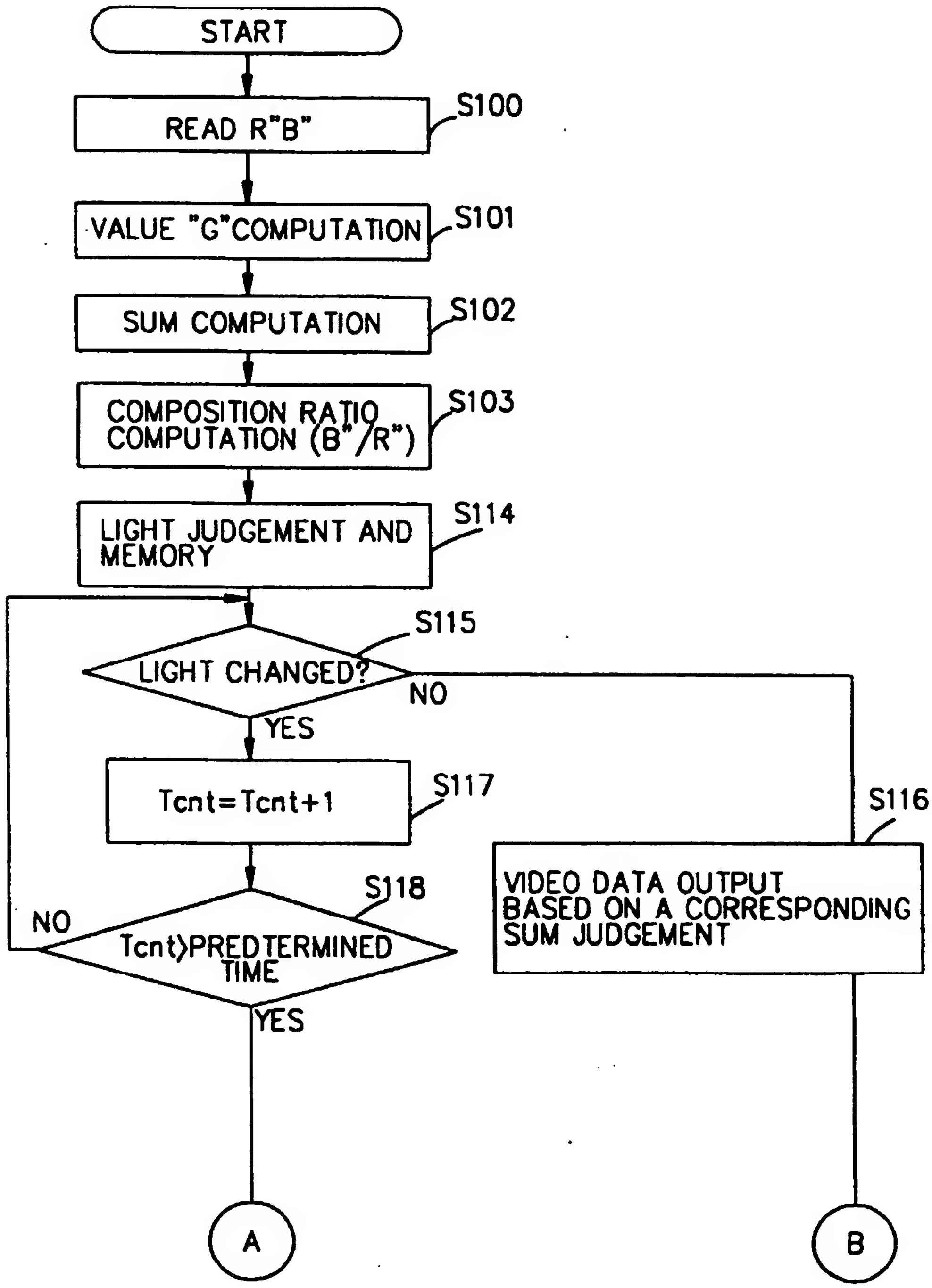

START
READ R"B"
S100
VALUE "G"COMPUTATION
S101
SUM COMPUTATION
S102
COMPOSITION RATIO COMPUTATION (B"/R")
S103
LIGHT JUDGEMENT AND MEMORY
S114
LIGHT CHANGED?
S115
NO
YES
Tcnt=Tcnt+1
S117
S116
VIDEO DATA OUTPUT BASED ON A CORRESPONDING SUM JUDGEMENT
S118
NO
Tcnt〉PREDTERMINED TIME
YES
A
B

FIG.7

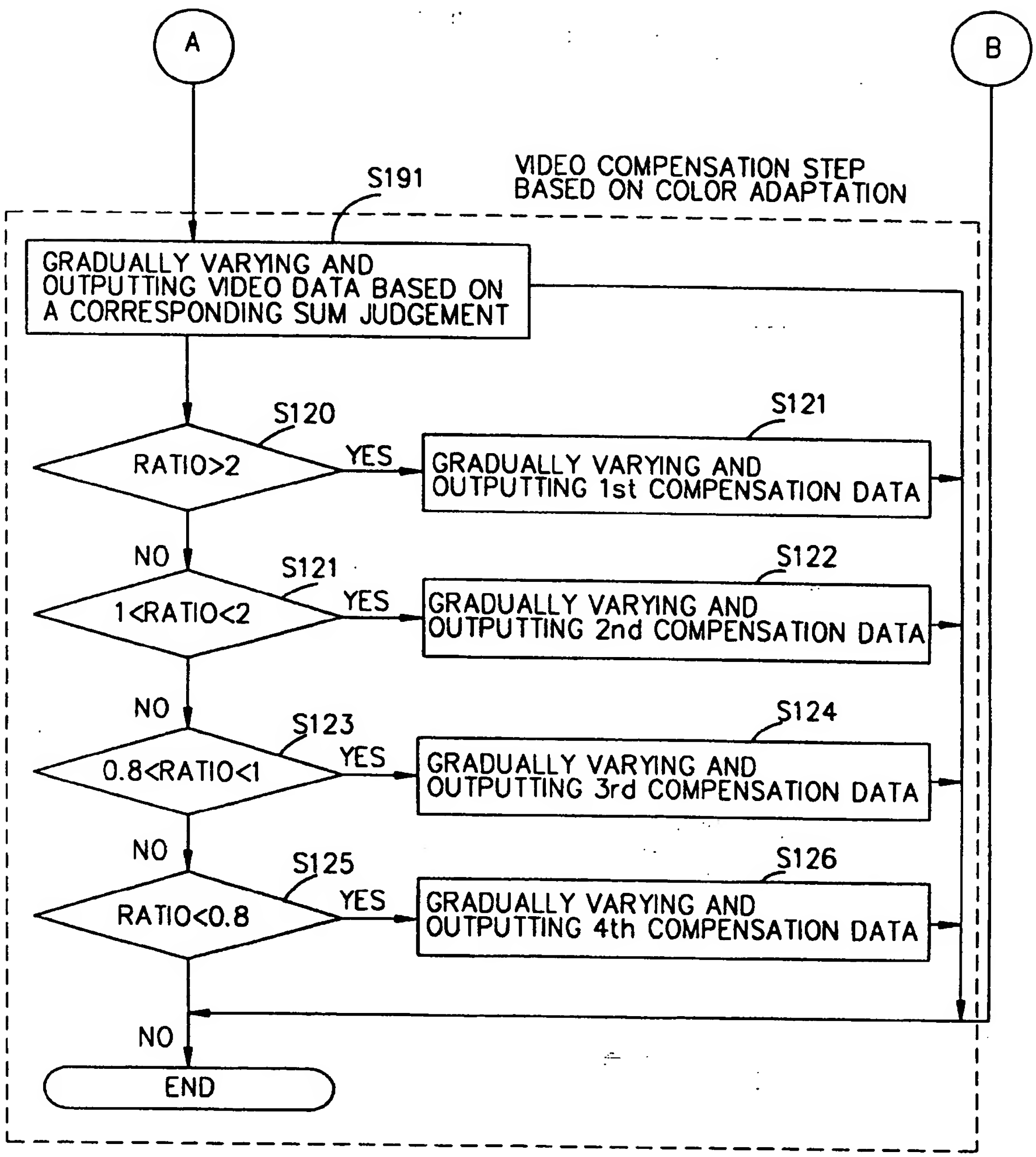

A
B
S191
VIDEO COMPENSATION STEP BASED ON COLOR ADAPTATION
GRADUALLY VARYING AND OUTPUTTING VIDEO DATA BASED ON A CORRESPONDING SUM JUDGEMENT
S120
RATIO>2
YES
S121
GRADUALLY VARYING AND OUTPUTTING 1st COMPENSATION DATA
NO
S121
1<RATIO<2
YES
S122
GRADUALLY VARYING AND OUTPUTTING 2nd COMPENSATION DATA
NO
S123
0.8<RATIO<1
YES
S124
GRADUALLY VARYING AND OUTPUTTING 3rd COMPENSATION DATA
NO
S125
RATIO<0.8
YES
S126
GRADUALLY VARYING AND OUTPUTTING 4th COMPENSATION DATA
NO
END

FIG. 8

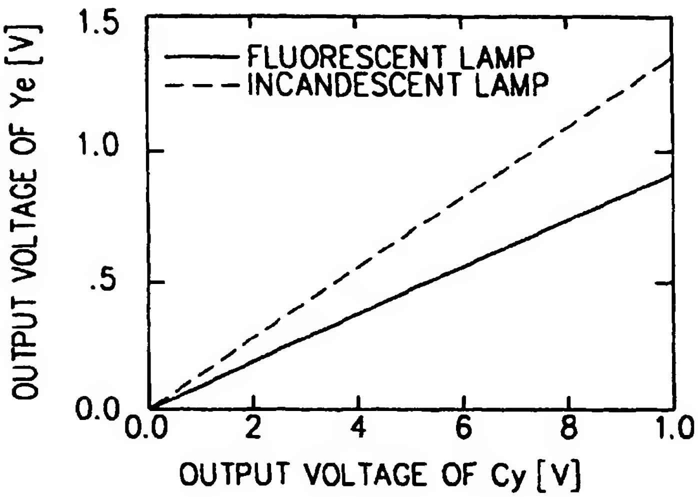

1.5
1.0
.5
0.0
0.0
2
4
6
8
1.0
FLUORESCENT LAMP
INCANDESCENT LAMP
OUTPUT VOLTAGE OF Ye [V]
OUTPUT VOLTAGE OF Cy [V]

FIG. 9

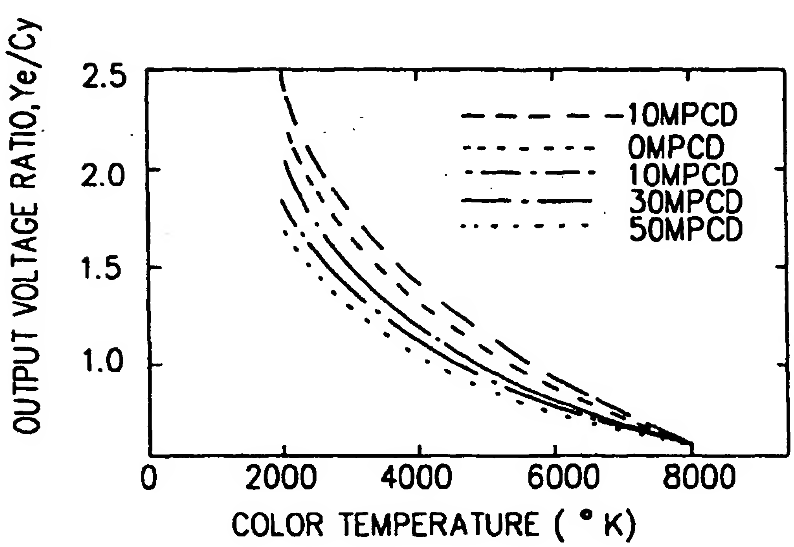
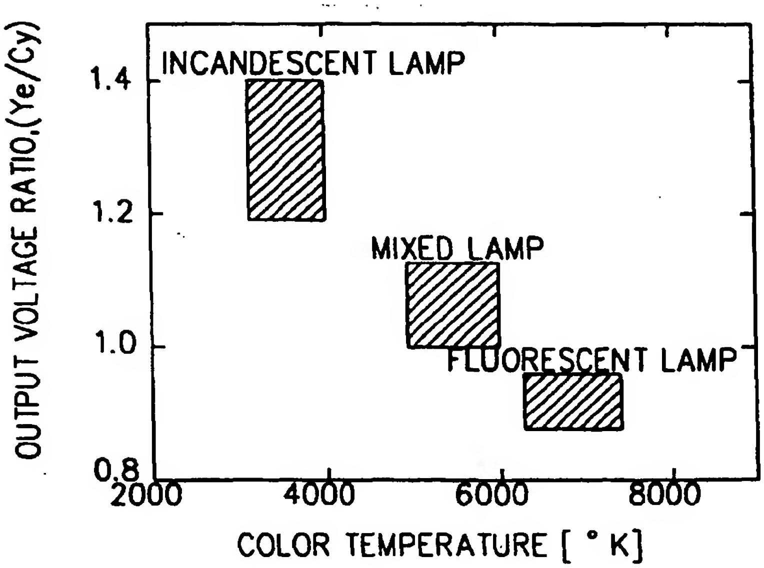

2.5
2.0
1.5
1.0
0
2000
4000
6000
8000
-10MPCD
0MPCD
10MPCD
30MPCD
50MPCD
OUTPUT VOLTAGE RATIO,Ye/Cy
COLOR TEMPERATURE (° K)

FIG. 10


INCANDESCENT LAMP
MIXED LAMP
FLUORESCENT LAMP
OUTPUT VOLTAGE RATIO,(Ye/Cy)
1.4
1.2
1.0
0.8
2000
4000
6000
8000
COLOR TEMPERATURE [° K]

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 40 2553

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	PATENT ABSTRACTS OF JAPAN vol. 17, no. 39 (E-1311), 25 January 1993 & JP 04 257194 A (SONY)	1,4	H04N9/73 H04N5/58
Y	* abstract *	3	
X	PATENT ABSTRACTS OF JAPAN vol. 10, no. 164 (E-410), 11 June 1986 & JP 61 016691 A (SHARP)	1,4	
Y	* abstract *	3	
Y	EP 0 700 218 A (LG ELECTRONICS INC.) 6 March 1996	3,5,8,10	
A	* the whole document *	11,12	
Y	PATENT ABSTRACTS OF JAPAN vol. 12, no. 307 (P-747), 22 August 1988 & JP 61 070887 A (MITSUBISHI) * abstract *	5,8,10	
A	EP 0 599 495 A (CANON INFORMATION SYSTEMS) 1 June 1994 * column 4, line 49 - column 5, line 51 * * column 11, line 24 - column 12, line 9; figures 3,8,9 *	1,3-5,8, 10-12	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H04N
A	PATENT ABSTRACTS OF JAPAN vol. 17, no. 13 (E-1304), 11 January 1993 & JP 04 243393 A (MITSUBISHI) * abstract *	1,3-5,8, 10	
A	PATENT ABSTRACTS OF JAPAN vol. 17, no. 13 (E-1304), 11 January 1993 & JP 05 083731 A (SANYO) * abstract *	1,3-5,8, 10	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 May 1998	Pigniez, T

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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